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FAO Plant Protection Bulletin

Vol. II, No. 4 A Publication of the January 1954

World Reporting Service on Plant Diseases and Pests

Cacao Diseases in Venezuela, Colombia, Ecuador and Trinidad

Rodrigo G. Orellana

Inter-American Institute of Agricultural Sciences, Turrialba, Costa Rica

In the American tropics, Ecuador, Colombia, Venezuela and Trinidad rank with Brazil and the Dominican Republic as the main producers of cacao. In the course of a tour extending from 3 May to 5 June 1953, these four states were visited to study the disease situation and general status of the crop.

General Information

In Venezuela, the annual cacao production is around 17,000 metric tons, or approximately 2.21 percent of the total world production. The main growing regions are Barlovento, Central and Oriente, producing 42.1, 8.2 and 48.2 percent respectively of the country's crop. The remaining small amount is produced in the western region. Most of the cacao grown in that country is of the Trinitario group, mainly Cundeamor and Angoleta. Amelonada is less common, and Calabacillo is reportedly almost non-existent. Pure Criollos are only occasionally found. Studies on yield variability have shown that 95 percent of the country's cacao harvest is produced by 23 percent of the trees, whereas 77 percent of them yield little or no cacao at all. Selection of high yielding and good quality cacao was initiated by the Ministry of Agriculture in 1946 and there are now about 40 clonal selections being propagated with pod indexes of 7-8 lbs. of dry cacao.

In Colombia, the cacao production for 1951 amounted to 13,000 metric tons, equivalent to 1.69 percent of the world production. Estimates for 1953 are above this figure. About 70 percent of the crop is grown in the Departments of Cauca and Valle, and 25 percent in the Departments of Huila and Antioquia. Some cacao is grown also in Caldas, Cundinamarca, Santander and Tolima, as well as on the Guaviare River and in the Amazon. The most common cacao types are Amazonian Forastero and Calabacillo. There are also few small plantings of pure Criollos, which have degenerated as evidenced by their small pods and beans. Pajarito cacao of this Trinitario group is also grown.

Ecuador's production for 1952/53 is estimated to be higher than the 1951 figure of 23,000 metric tons that represented 3 percent of the world supply. Cacao is grown mainly in the humid, garua–falling areas of the Provinces of Guayas and Los Rios, and to some extent in the Provinces of El Oro, Esmeraldas, and Manabi. Uncultivated cacao occurs in the Amazon region. Cacao nacional of the Amazonian Forastero group and Criollos are the most valuable cacaos grown in Ecuador because of their excellent flavor. Cacao nacional was probably introduced long ago but has deteriorated in quality due to hybridization with the inferior Trinitarios. Criollos are known to exist in the Ecuadorean Amazon region also in the Esmeraldas Province.

Trinidad and Tobago produce annually about 8,000 metric tons of cacao or 1.04 percent of the world production. In Trinidad, the crop is grown in small valleys located among the hills of the central and northern mountain ranges, and in the valleys of the lower slopes of the Northern Range.

Witches' Broom

Witches' broom, caused by *Marasmius perniciosus* Stahel, was first reported in 1895 from Surinam, whence it spread into Colombia and Ecuador before 1920, and later into Venezuela and Trinidad. It is now generally regarded as the most destructive disease of cacao in the countries visited, except Colombia. The disease incidence in Venezuela, however, appears to have declined recently, though it is still serious in the Oriente and in certain areas of the Central region.

In Colombia, the disease is prevalent in the wet lowlands in the south-west of the country, around Tumaco in the Department of Narino, but does not appear to cause much damage in the important cacao areas in Cauca Valley.

In Ecuador, this disease is highly destructive in the humid low areas of the Provinces of Guayas, Los Rios and Esmeraldas. In El Oro, it is reportedly of lesser importance. The disease thrives particularly at altitudes below 700 feet and causes severe losses at the end of the rainy season.

Extensive programs to develop cacao clones resistant to witches' broom are being carried out in Trinidad and Ecuador. In the Imperial College of Tropical Agriculture, Trinidad, a constant search for resistant material has been in progress for some years. Among the clones now being studied and propagated, SCA 6 and SCA 12 introduced from Iquitos, Peru, are considered to be immune to this disease. Both have small pods and small beans and their yielding capacity is still unknown. Other resistant clones are ICS 1, 6, 8, 39, 45, 89 and 95. Of this group ICS 1 and 95 are the most resistant and high yielders and are being propagated for distribution at the Pastora propagation center operated by the Government Cocoa Board.

In the Tropical Experiment Station at Pichilingue, Ecuador, five hundred clonal selections from Ecuador and from foreign sources are being tested for resistance to witches' broom. Results indicate that Ecuadorean clone SCA 6 is practically immune and SCA 9 and SCA 12 are highly resistant. Among the promising clones now being propagated are the following: ETE 247, 161, 162, 48, 61, 78, 82, 88, 156, 224, and 237. Tests along the same line are also being carried out at the Clementina farm, where a planting of 300 acres with seedlings up to 3 years is being maintained. Clonal selections from Trinidad, ICS 1 and 95, were found to be resistant and a number of Ecuadorean selections, including Casa Grande, Santa Isabel, Santa Rosa, Silesia and Porvenir, showed promise.

Monilia Pod Rot

Pod rot, caused by *Monilia roreri* Cif., is perhaps the most important disease of cacao in Colombia. This disease, as well as witches' broom and Phytophthora pod rot, occurs in most cacao growing areas of the country and inflicts heavy losses particularly in Cauca Valley and Valle as well as in Antioquia, Caldas, Santander and Huila. Losses in El Valle were estimated to reach 90 percent in certain years, with an average of 30 percent. Amelonado, Cundeamor and Calabacillo of the Trinitario group were found to be most susceptible and Criollos rather resistant. As in other countries where this disease is present, little is known regarding the methods of infection and dissemination and other basic facts required for devising control methods. Resistance of the six Palmira SCP clones to Monilia pod rot and other diseases, excepting foliar anthracnose, has not yet been determined. Successful inoculations have been obtained only when the pod has been previously wounded. Substantial control of this disease, however, has already been achieved by fungicidal sprays, through the extension campaign organized by the Palmira Experimental Station.

Monilia pod rot is also widespread and very destructive in Ecuador, particularly in the more humid areas. Its general prevalence gives the impression that losses due to it may be as high or sometimes even higher than those of witches' broom. Cacao nacional is very susceptible and the yellow pod Trinitarios are known to be most tolerant. Preliminary experiments conducted at Pichilingue indicate that the *Monilia* fungus survives in the soil and is possibly effectively disseminated also by wind. Attempts to determine the method of infection,

suspected to occur in the flowers, have been inconclusive.

At the time of my visit to Venezuela, Monilia pod rot was not observed in the Ocumare, Choroni and Caucagua valleys of the Central region. It is known, however, to cause considerable damage in certain areas.

This disease has not been reported from Trinidad.

Phytophthora Disease

Cacao pod rot due to *Phytophthora palmivora* Butl. is a disease of universal occurrence and may have caused more damage than has been recorded. Its development is generally favored by high humidity and prolonged rainy periods.

The disease is prevalent in the wet low areas of all the four countries visited, though it is frequently overshadowed by the spectacular and more destructive diseases, witches' broom and Monilia pod rot. It does not appear to be serious in the Central region in Venezuela and is practically insignificant on the hills in Trinidad. Preliminary studies carried out by the Imperial College of Tropical Agriculture indicate that there exist at least three strains of *P. palmivora*.

Trunk canker caused by the same fungus is highly destructive in pure Criollo plantings in the El Bolo area of the Cauca Valley in Colombia. This disease, however, is very mild on other groups of cacao and is neither important in other areas in Colombia nor in the other three countries visited. Considering together both types of injuries caused by *P. palmivora*, losses in Colombia, according to Carlos Garcés Orejuela, amount to 35 percent in general.

Other Diseases

Ceratostomella fimbriata (Ell. & Halst.) Ell., a fungus causing severe cankering in the trunk of cacao trees was reported from Venezuela only about two years ago, but now inflicts losses estimated at 3 to 5 percent. During my trip I saw badly affected trees being cut down and burned in the most affected Choroni area, and I also observed this disease in the Ocumare de la Costa area. The disease appears to be spreading and thrives at low elevations, but cacao plantings on the hills are apparently clean.

Ceratostomella trunk canker is also present in cacao plantings at Pichilingue, Ecuador. Its distribution and losses in that country are unknown. Cacao nacional appears to be susceptible.

The virus disease of cacao was first found in Trinidad in 1943, but had undoubtedly been present for many years. Through continued survey and eradication of infected trees in areas affected more recently, the disease appears now to be restricted mainly to the west end of the Northern Range. It is particularly prevalent in the valleys of Diego Martin, Santa Cruz and Maracas, where the largest cacao plantations are located. Two strains of the virus, A and B, have been recognized. The Trinidad virus differs from the more virulent, swollen shoot virus complex in West Africa in that it does not produce the typical swollen shoot symptoms. Infection, however, results in significant yield reduction.

Cherelle wilt results in high losses of young pods in Trinidad as well as in other countries. The nature of this disorder is not yet fully understood. Some of the wilted cherelles are apparently associated with infections of *Phytophthora* or other fungi. It has been suggested that this disorder may be physiological or due to abnormal pollination.

Anthracnose caused by *Colletotrichum* spp. was observed to be serious in many cacao plantations in Colombia, particularly on new leaves of young clonal plantings at Palmira. Among the six Palmira clonal selections tested, SCP 1, 5 and 6 were found to be susceptible and SCP 2 somewhat resistant. All these clones are of the purple varieties of Angoleta.

Root rot, due to *Rosellinia* spp., was found to have killed many trees in cacao plantations in wet soils in the Province of Los Rios, Ecuador. Although it has not assumed any importance at present, investigations are needed to determine its potentialities. This disease is also often troublesome in some areas in the Department of Huila of Colombia, and in Trinidad.

Self-incompatibility in cacao is reported in Colombia to be responsible for great losses in yield. In some areas of the Cauca Valley,

there exist up to 50 percent of self-incompatible trees. This phenomenon is believed to be generally due to the presence of an inhibitory substance which delays development of the pollen tube. Vitamin B_1 deficiency is also sometimes a cause of inadequate fertilization in self-sterile flowers.

Erythrina poeppigiana, locally known as Anauco or Immortelle, is widely used in Trinidad as a shade tree, but it is faced with destruction by diseases, the etiology of which is not yet known. This tree is also often infected with canker and killed in Colombia by a fungus, *Calostilbe striispora* (Ell. & Everh.) Seaver.

Notes on Insect Injuries to Crops in Afghanistan

G. S. COTTERELL

Expanded Technical Assistance Program, Agriculture Division, FAO

THE present notes supplement the preliminary report[1] on major pests of crops in Afghanistan, published about a year ago. During my sojourn in that country from June 1952 to October 1953, a large part of the time was taken up by field trips, covering most of the important agricultural regions. The difficulties in transportation, however, prevented me from visiting many distant localities as frequently as I intended to. Therefore, much information on losses caused by pests had to be gathered from farmers and the provincial administration and thus allowance must be made for margin of errors.

The incidence of plant pests and diseases in Afghanistan, in particular those affecting deciduous fruits, is frequently accentuated by the lack of regular markets and the lack of attention to cultural practices considered to be normal in many other countries. In many areas it was observed that heavy infestation occurred on surplus of fruit left on the trees after the normal harvesting time and might become uncontrollable except by drastic removal of the infested parts of the trees. There are some areas in the country where high agricultural standards are maintained, for instance, at Rausa, near Ghazni, where a particular variety of plum is grown for export and in Tirin valley whence large amounts of dried apricots are exported. These areas, however, are always threatened by insects and diseases which may spread from heavily infested areas.

Chemical control is usually beyond the means of the average producer, because all chemicals and appliances must be imported and transportation expenses are high. Under the present conditions, the improvement of general farming practices and the adoption of proper cultural and sanitation measures to reduce the incidence of pests and diseases should therefore receive primary attention.

Cereal Crops

Army worm (*Cirphis unipuncta* Haw.) heavily infested wheat throughout the Kabul plateau in 1953. Outbreaks became widespread in early and late spring. In many fields, plants were completely defoliated and in some instances heads were also destroyed. In most areas heavy infestation occurred only after heads had formed and the crop was too far advanced to be seriously affected, but in others a 10 percent reduction in yield was reported.

Maize stem borer (*Chilo zonellus* Swinh.) was common in Eastern Province, particularly in the Laghman valley, where up to 20 percent of the plants might be infested. Young larvae fed on exposed leaves and later bored into stems, thus preventing the ears from becoming fully developed. The insect overwinters as fully grown larvae or pupae in stubble.

Rice stem borer (*Schoenobius incertellus* Walk.) was prevalent in Eastern Province, particularly in the Laghman valley, where in some fields 30 percent of the stems were observed affected. When rice plants were attacked during the flowering stage, losses were heavy because the formation of heads and grain was prevented and tiller development was delayed.

[1] COTTERELL, G. S. Major pests of crops in Afghanistan: A preliminary note. *FAO Plant Prot. Bull.* 1: 52–55. 1953.

Cotton

Cotton growing areas in northern Afghanistan are relatively free from insect pests with the exception of the cotton aphid, *Aphis gossypii* Glover, which is common wherever cotton is cultivated and often causes severe localized damage to young plants. A bollworm, *Heliothis armigera* Hübn., was observed in Kataghan Province in the north-east, but its infestations were sporadic.

In the southern part of the country, several noxious insects occur on cotton. These insects were not observed in the north and their spread should be prevented.

Sugar Cane

Stem borer (*Argyria* sp.) and root borer (*Emmalocera depressella* Swinh.) caused losses amounting to one percent of canes in certain areas of Eastern Province. The red perennial variety of sugar cane appears to be more resistant, but is largely responsible for perpetuating the pest from season to season.

Sugar cane hopper (*Pyrilla* sp.) breeds on the inner side of leaf sheaths, causing wilt of leaves. Localized outbreaks were often severe in Eastern Province.

Deciduous Fruits

Lesser ermine moth (*Hyponomeuta padellus marginellus* L.) was frequently very destructive in the important almond growing areas of the Ghorband valley and to apples and plums in Ghazni, Kabul Province. Losses in fruit amounted to over 80 percent in some orchards. Incidence is sometimes erratic, as infestation may be heavy in one locality whereas nearby places are only lightly affected or even free from this pest. For instance, at Gardez, in Southern Province, where climate and vegetation are the same as at Ghazni less than 60 miles away, the lesser ermine moth has not yet been observed.

Codling moth (*Carpocapsa pomonella* L.) is one of the limiting factors in apple production in all parts of Afghanistan. In neglected orchards, up to 80 percent of the fruit may be damaged. The adult moths emerge in March to April and lay eggs on leaves, twigs and fruit just after the trees have bloomed. Young caterpillars commence to feed on leaves and then enter developing fruit. Infested fruits mostly drop and the larvae complete their life cycle on the ground. They become fully grown in 3 to 5 weeks and then leave the fruit to pupate. There are two to three generations each year depending on the temperature.

Almond webworm (*Malacosoma* sp.) was common in Kolat-i-Gilzai district of Kandahar Province, where at least one percent of the trees had one or more shoots infested. The insect overwinters in the egg stages. The eggs hatch in March and the young larvae form thick matted webbing around infested shoots. They come out to feed in the heat of the day and return at night to the webbing, in which they pupate. Infected shoots fail to produce fruit.

A Lymantriid moth (*Euproctis signata* L.) was observed frequently at Gardez, Southern Province, defoliating deciduous fruits, willow, poplar and other shade trees. Eggs are laid in June to July in cylindrical masses attached to the under surface of leaves and are covered with brown hairs. The larvae are also covered with hairs which, in contact with the skin, cause an irritating rash and, if breathed into the lungs, sometimes cause serious illness. According to a report, this insect was a serious pest at Ghazni, 92 miles southwest of Kabul, about 15 years ago, but is now rarely seen.

Terrapin scale (*Lecanium* sp.) was observed attacking shoots of a number of deciduous fruit trees everywhere in spring and early summer, particularly where irrigation water was not plentiful.

Citrus

Citrus in Eastern Province is commonly attacked by several pests. The red scale (*Aonidiella aurantii* Mask.) infests all parts of trees, particularly fruits, on which it causes mottling. Another scale (probably *Saissetia* sp.) attacks shoots of all citrus varieties. Leaf miner (*Phyllocnistis* sp.) is

especially injurious to citrus seedlings, seriously retarding their growth. In addition, an unidentified beetle borer of Cerambycidae causes considerable damage to the trunks and main branches of sour orange, the attack being confined to very old trees.

Stored Grain

In the warmer parts of the country grain stored in bulk was often severely attacked by Khapra beetle (*Trogoderma granarium* Everts.), lesser grain borer (*Rhizopertha dominica* F.) and rice weevil (*Sitophilus oryzae* L.). The Khapra beetle is largely confined to wheat and barley, whereas the other two pests develop equally well in stored rice and maize. Damage, particularly caused by the Khapra beetle and lesser grain borer, can be very serious, especially in old godowns.

These insects are unable to survive the winter climate of Kabul or other localities where the winter is severe.

Detection of Virus B of Chrysanthemum in the United States

PAUL R. MILLER

Bureau of Plant Industry, Soils, and Agricultural Engineering,
United States Department of Agriculture.

BEFORE 1952 six virus diseases were recognized as affecting chrysanthemum in the United States,[1] namely tomato spotted wilt, aster yellows, chrysanthemum stunt, Blanche mosaic, Ivory Seagull mosaic and tomato aspermy. In 1952, Noordam[2] reported a serious increase in virus diseases of chrysanthemum in the Netherlands as a result of importing new varieties from England and the United States. Studies of these diseases led him to describe three viruses, i. e., a chrysanthemum strain of cucumber mosaic virus and chrysanthemum viruses B and C.

The virus which Noordam classed as *Cucumis virus 1* strain *chrysanthemum* is evidently the one called tomato aspermy virus by English and American workers. This virus is prevalent in western Europe and is believed to be increasingly common in the United States, although only six separate identifications have been known so far. It is manually transmissible to tobacco, petunia, and *Physalis angulata*, producing systemic symptoms in all.

Noordam's virus B was reported to produce yellow local lesions, but not systemic symptoms in petunia, and no infection in tobacco or tomato. Among 31 plant species inoculated by Noordam, snapdragon, calendula, China aster, *Helichrysum bracteatum*, *Nicotiana glutinosa*, petunia and chrysanthemum proved susceptible.

Among the viruses described by Noordam, virus B is of especial interest because it occurred very frequently in The Netherlands and was not previously known in the United States. In experimental work on chrysanthemum viruses carried out by P. Brierley and F. F. Smith of the Department of Agriculture at Beltsville, Maryland, U. S. A., petunia was therefore used as an index plant for the first time in February 1953 to permit detection of this virus. Sixty chrysanthemum stocks of known and unknown virus content were tested on petunia as well as on tobacco and *Physalis angulata*.

Detection of Virus B

In the inoculation experiments, tomato aspermy virus was recovered only from seven chrysanthemum stocks. It was recognizable as systemic veining and mottling on petunia after six days and on tobacco and *Physalis* after eight days. Petunia proved as sensitive as tobacco or *Physalis* in reacting to the aspermy virus.

Characteristic symptoms of Noordam's virus B, consisting of solid yellow local lesions, usually 2 to 3 mm. in diameter, appeared in the petunia in 14 to 21 days after inoculation with sap from 17 chrysanthemum stocks. Typically, no systemic effects followed in petunia, but the local lesions sometimes extended slightly along veins and in one plant a single branch was systemically invaded. Virus B was subcultured from this systemically invaded branch, but not from the symptomless upper leaves. No symptoms appeared in tobacco or *Physalis* from these inoculations and virus B was not recovered from these plants. Chrysanthemums yielding these local lesions in petunia were Crystal Valencia (mosaic), Good News (mosaic), Blanche (mosaic or crinkle), Matador (mosaic), Paris daisy (*Chrysanthemum frutescens*, symptomless), the garden chrysanthemums Lavender Lady, Lee Powell, Major Cushion, Red Velvet,

[1] BRIERLEY, P. and F. F. SMITH. Survey of virus diseases of chrysanthemums. *Plant Dis. Reptr.* 35: 524–526. 1951.

[2] NOORDAM, D. Virus diseases of *Chrysanthemum indicum* in the Netherlands. *Tijdschr. Plantenz.* 58 : 121–189. 1952.

Remembrance, Roza, and transfers from these independent samples.

The distinctive localized reaction in petunia, the time of appearance of these symptoms, and the failure to infect tobacco or *Physalis* indicate that the virus is Noordam's virus B.

Noordam's virus B is present in the Nightingale stock that has been maintained as a source of aspermy virus and in Good News and Blanche stocks, maintained as sources of Q virus, described recently by Keller [3] as the cause of Blanche or Good News mosaic. The presence of this additional virus in the stock sources of aspermy and Q mosaic viruses calls for re-evaluation of the data on these two viruses. Since virus B was not detected in the stock sources of stunt virus in Mistletoe or of rosette virus in Ivory Seagull, these viruses are not confused with virus B.

Differentiation of Virus B from Aspermy Virus

Results of experiments carried out in 1952 and 1953 to determine the virus contents of various chrysanthemums previously inoculated by grafting or by aphids with aspermy virus, Noordam's virus B, or both, are summarized in Table 1. As can be seen, there is a lack of correlation between expression of symptoms in chrysanthemums and recovery of the aspermy virus from them, which condition has long puzzled the investigators. It is now clear that Noordam's virus B is present but had not been suspected in the Nightingale stock, which has been grafted on to Good News and other chrysanthemum varieties to transmit the aspermy virus. Good News inoculated from this source by grafting, by aphids, or by sap all showed the same diffuse, often patchy, dull yellowish mottling without leaf distortion. Such symptoms, previously ascribed to aspermy virus, are really caused by virus B. Sap inoculation with pure aspermy virus from tobacco or *Physalis* produced no symptoms in the chrysanthemum varieties Good News, Dynamo, Horizon, Mary Garden, Pandora or Yellow Shasta, but aspermy virus was recovered from these.

Moreover, some other stocks of aspermy virus, namely Delia and Mayford Pink from England, and an unnamed variety from Denmark, also carried virus B together with aspermy virus, inasmuch as these produced the same symptoms in Good News and other chrysanthemum varieties as did the Nightingale stock. Virus B symptoms developed in Good News in 30 to 40 days after sap inoculation from affected petunia.

Inasmuch as aspermy virus is infectious to tobacco, tomato, and *Physalis*, but virus B is not, experimental transmissions to or from these test plants deal with aspermy virus only. Thus, the data on host range and properties of aspermy virus are unaffected by detection of virus B in Nightingale.

Aspermy virus is damaging to tomato, tobacco, lettuce, spinach, pepper, and a number of ornamental plants. It is doubtful whether it causes any significant damage in chrysanthemum, for it is symptomless in Good News and in other sorts. The conspicuous flower distortion, frequently ascribed to aspermy virus by European writers has never appeared in the cultures used in the United States. All except Roza of the 17 varieties listed in Table 1 have been flowered at least once when affected with aspermy virus plus virus B, but none has ever shown distortion of the flowers. It seems likely that an additional component virus, not yet recognized in the United States, is concerned in the distortion of chrysanthemum flowers.

Because aspermy is damaging to vegetable crops and is not known to be generally prevalent in the United States, some propagators may wish to exercise special care to avoid disseminating it. The data in Table 1 show that the index test on tobacco or on *Physalis* is not consistently reliable for indicating presence of aspermy virus. Some varieties, such as Nightingale and Mary MacArthur, yielded this virus whenever tested. Others, such as Golden Curry, Vibrant, and Charmer, yielded no aspermy virus until the second or third test, 9 to 11 months after graft inoculation. The difficulty in detecting the aspermy virus does not lie in the test plants, for tobacco, *Physalis* and petunia appear to

[3] KELLER, J. R. Report on indicator plants for chrysanthemum stunt virus and on a previously unreported chrysanthemum virus. *Phytopath.* 41 : 947–949. 1951.

Table 1. *Symptom expression and virus detected in various chrysanthemums inoculated with aspermy virus A, or Noordam's virus B, or both, in 1952.*

Source Plant	Symptoms on Chrysanthemum	Virus Detected in 1952		Virus Detected in 1953	
		On tobacco Mar.	On *Physalis* Oct. Dec.	On petunia Feb.	On tobacco Feb.
Source plant grafted on Nightingale stock					
Alpine	O	A	A		
Blazing Gold	O	A	A		
Dynamo	O		A		
Golden Harvest	O		A		
Good News	B	A	A		
Lillian Doty	B		A		
Pandora	B		A		
Rusticon	B	O	A		
Seagull	O		A		
Silver Sheen	O		A		
Golden Curry	B		O A		
Vibrant	B		O A		
Charmer	B		O O	A	A
Mary MacArthur	O		A A	A	A
Mistletoe	B	A	O O	B	O
Source plant inoculated with aphids from Nightingale					
Good News (*Myzus solani*)	B	A	O O	A	A
Good News (*Rhopalosiphum rufomaculatum*)	B	A	O O	B	O
Source plant grafted on Roza stock					
Good News	B		O O	B	O
Stock source as source plant					
Nightingale	O,B		A A	A	A
Roza	O		O O	B	O

be adequately and about equally sensitive. Apparently the aspermy virus is slow and erratic in invading chrysanthemum systemically.

Aphid Transmission of Virus B and Aspermy Virus

Experiments with aphid transmission from the Nightingale chrysanthemum, now known to carry B and aspermy viruses, yield data on vectors of both viruses, which can be differentiated by reactions on test plants. The mottle pattern in Good News shows presence of virus B, and positive reaction in tobacco or tomato shows presence of aspermy virus. Thus, the data in Table 2 show that virus B was carried by *Macrosiphoniella sanborni*, *Myzus persicae*, *M. solani*, and *Rhopalosiphum rufomaculatum*; aspermy

Table 2. *Transmission of tomato aspermy virus (A) and Noordam's virus B by aphids*

Aphid Species	Source Plant [a]	Test Plant [b]	Number Plants Infected over Number Exposed	Virus Transmitted
Anuraphis helichrysi	Chrysanthemum	Chrysanthemum	0/10	—
Aphis gossypii	Chrysanthemum	Chrysanthemum	0/13	—
	,,	Tobacco	0/10	—
Macrosiphoniella sanborni	Chrysanthemum	Chrysanthemum	1/10	B
	,,	,,	3/10	B
	,,	Tobacco	2/10	A
Myzus persicae	Chrysanthemum	Chrysanthemum	2/10	B
	,,	Tobacco	8/10	A
	,,	,,	3/5	A
	,,	Tomato	5/10	A
	Tobacco	Tobacco	2/5	A
	,,	Tomato	5/10	A
	Tomato	,,	5/10	A
Myzus solani	Chrysanthemum	Chrysanthemum	2/10	B
	,,	Tobacco	5/5	A
	Tobacco	,,	3/5	A
	Tomato	Tomato	10/10	A
	,,	,,	10/10	A
Rhopalosiphum rufomaculatum	Chrysanthemum	Chrysanthemum	0/10	—
	,,	,,	5/10	B

[a] Varieties used: Nightingale chrysanthemum; Samsun Turkish tobacco; Marglobe tomato.
[b] Varieties used: Good News chrysanthemum; Samsun Turkish tobacco; Marglobe tomato.

virus was carried by the first three of these species, but was not transmitted by the last. No evidence was found that *Anuraphis helichrysi* or *Aphis gossypii* transmitted either virus. All these tests were designed to detect non-persistent transmission.

Identity of Virus B

The B virus is common in the United States as well as in Europe. It has been detected repeatedly in graft-indexing American chrysanthemum varieties, but has been construed as a mild strain of Keller's Q virus which was termed chrysanthemum mosaic virus. Since the type stocks of Q virus in Blanche and Good News cause the virus B reaction in petunia, it may be assumed that virus B is a mild form of Q virus, or that Q virus is a complex with virus B one of the constituents. Evidence is insufficient to decide between these two hypotheses at present, but the second is favored.

Outbreaks and New Records

Algeria (France)

Plant Protection Service, Algiers

Discovery of Potato Root Eelworm

POTATO root eelworm (*Heterodera rostochiensis* Wr.) had not been known to exist in Algeria until March 1953, when it was discovered for the first time in the immediate vicinity of the city of Algiers. By the following December infestations had been ascertained in seven communes of the Algerian territory. Investigations are continuing in all regions where potatoes and tomatoes are grown.

Infestation is determined either by direct observation of the tubercles on the roots or by soil sampling. No special protective measures have as yet been adopted. Intensified inspection both at points of entry and in the interior of the territory is contemplated. Soil disinfestation with DD has so far given good results in heavily infested fields.

This pest is usually regarded as occurring more commonly in a cold than in a warm climate. Its discovery in Algeria is the first recorded occurrence on the southern coast of the Mediterranean.

(The above information was received from the European Plant Protection Organisation, Paris.)

Canada

C. G. MACNAY

Entomology Division,
Department of Agriculture, Ottawa

The following records, made in 1952, are of insects new to certain provinces but previously known to be present elsewhere in Canada.

An Injurious Wireworm on Cereals

The wireworm *Agriotes obscurus* (L.), a very injurious species, was found to infest maize and rye severely on a single farm near Agassiz in the lower Fraser Valley, British Columbia, causing extensive damage. This pest has been established in restricted areas of Newfoundland and Nova Scotia at least since 1936, and in 1949 it was found at Cobble Hill on Vancouver Island. Before the discovery at Agassiz, it was not known to be present on the mainland of western North America, nor has it been reported from the United States. It is believed that the insect was brought to Agassiz between 1895 and 1900 in the soil used for packing hop plants. Infestations in Newfoundland and Nova Scotia are believed to have originated from contaminated ballast unloaded from ships in sailing vessel days.

A Weevil on Fruit and Shade Trees

A leaf-eating weevil, *Phyllobius oblongus* (L.), which attacks fruit trees and shade trees, was collected for the first time in Ontario on white elm (*Ulmus americana*) at Aikenville, in Wellington County, in 1950, and was taken from walnut at Galt, Ontario, in 1952. The larvae attack the roots of strawberry and other plants. The insect has been reported in recent years also from New Brunswick, and from the State of New York, U.S.A.

Cottony Maple Scale on Grape

The cottony maple scale, *Pulvinaria vitis* (L.), was recorded on grape at St. John's, Newfoundland. It occurs commonly on a

wide variety of hosts in many other areas of Canada, notably in British Columbia and Ontario, but is of comparatively minor economic importance in this country.

European Pine Shoot Moth

The European pine shoot moth, *Rhyacionia buoliana* (Schiff.), was found affecting pine seedlings in Newfoundland and Prince Edward Island, where infestations were confined to provincial nurseries at St. John's and Charlottetown, respectively. This insect is believed to have originated from infested nursery stock introduced from other areas in Canada where the insect had been established. Austrian pine (*Pinus nigra*) and Scots pine (*P. sylvestris*) were attacked more extensively than red pine (*P. resinosa*). Infestations, however, were rather light and are believed to have been eliminated.

Lesser Clover Leaf Weevil

The lesser clover leaf weevil, *Hypera nigrirostris* (F.), was recorded from Newfoundland, where it occurred on red clover, causing a significant reduction in yield. The species has been of considerable economic importance in clover crops throughout agricultural areas elsewhere in eastern Canada.

Netherlands New Guinea

H. W. MOLL

Section of Agricultural Research,
Division of Agriculture and Stock, Hollandia-Haven

New Insect Records

Two previously unrecorded insects were reported affecting maize in the subdistrict Merauke, South New Guinea, during the months of September and October, 1953, namely: *Heliothrips striatoptera* Kob., black maize thrips, causing damage locally towards the end of the dry season; and *Peregrinus* sp., maize leafhopper, badly damaging maize grown for seed purposes at the Agriculture Station, Merauke.

Rhinoceros Beetle on Coconuts

Oryctes rhinoceros Ol. was identified in a small coconut planting in the Isle of Japen. This beetle, as well as other Dynastidae–beetles such as *Xylotrupes gideon* L. and *Chalcosoma atlas* L., usually causes only slight damage in this territory, although it is considered as a pest of major importance in some other Pacific areas.

New Zealand

Horticulture Division,
Department of Agriculture, Wellington

Further Notes on Diseases and Pest Previously Reported

Through further investigations, previous reports concerning two diseases and one insect need to be rectified with regard to the identities of causal agents or the host range.

Azalea leaf miner, *Gracilaria azaleela* Brants, was reported (FAO *Plant Prot. Bull.* 1:30. 1952) to occur on azalea and rhododendron. This pest has not been confirmed on rhododendron.

Cherry marbling was reported (FAO *Plant Prot. Bull.* 1:75. 1953) to be a virus disease. The available evidence now suggests that this disorder is a chimera.

Verticillium wilt of hop was reported (FAO *Plant Prot. Bull.* 1:122. 1953) to be caused by *Verticillium dahliae* Kleb. The fungus has since been re-identified as *V. albo-atrum* Reinke & Berth., whose host range in New Zealand, in addition to hop, includes cucumber, potato, strawberry, tobacco and tomato.

Spain

M. J. DE URRIES

Laboratory of Mycology,
Botanical Gardens, Madrid

Outbreaks of Root Rot of Cereals

Wheat and barley were seriously damaged by root rot in 1953 in many localities in Toledo, province of central Spain, and in Teruel, province of southern Spain. Affected plants had probably been weakened previously by unfavorable weather conditions. Rye was not attacked. This disease had seldom become troublesome before in this country.

Fusarium culmorum and other species of this genus, as well as *Helminthosporium sativum* were isolated from diseased plants. Some of the isolates proved to be capable of causing seedling blight and root rot in wheat.

In Teruel province, the disease apparently originated from infected seed. Samples of the seed originally used by the growers were examined and plated and various species of *Fusarium*, *Helminthosporium* and *Alternaria* were cultured. One sample was found to carry internal mycelium in as many as 80 percent of kernels. In Toledo province, the stubbles left in some fields were found to be infected by the root rot fungi.

PLANT QUARANTINE ANNOUNCEMENTS

Algeria (France)

Order of 30 July 1953 relative to the import into Algeria of plants, parts of plants or plant products capable of carrying San José scale, as published in the *Journal Officiel de l'Algérie*, Vol. 27, No. 62, 4 August 1953, amends Article 3 of the Order of 22 December 1952 (*see* FAO *Plant Prot. Bull.* 1:93. 1953) by adding the following provision.

Greenhouse plants, other than those mentioned in the Order of 22 December 1952, shall be inspected upon arrival and shall be disinfected in case infestation has been observed.

British Guiana

Plant Protection (Cotton Pests) Regulations of 12 January 1953 prohibits the importation of cotton lint, cotton linters, cottonseed meal or cottonseed cake into British Guiana, except under permit issued by the Director of Agriculture who may, at his discretion, determine the countries or places from which such imports may be allowed. In granting the required permit, the Director of Agriculture may impose such conditions with regard to the manner and means of transportation and to the taking of the necessary measures for fumigation of the consignments in the exporting country. He may also require and define the terms of a certificate of fumigation to be issued by the plant inspection service of the exporting country and to be produced to the Comptroller of Customs before the entry of the above-mentioned materials.

These regulations are not applicable to the importation of manufactured cotton goods, prepared cotton wool or other processed cotton or to cotton lint or linters contained in factory-made mattresses or other manufactured articles.

North Borneo

The Agricultural Pests (Prohibited Plants) (Amendment) Rules of 14 May 1953 amends the Agricultural Pests (Prohibited Plants) Rules of 1940 by adding the following plants of the genus *Hevea*, whose importation into North Borneo is absolutely prohibited:

Hevea spruceana; H. guianensis; H. nitida; H. pauciflora; H. minor; H. microphylla; H. rigidifolia.

Tunisia (France)

Order of 26 November 1953, published in the *Journal Officiel Tunisien*, Vol. 71, No. 95, 27 November 1953, supplements the Order of 26 July 1932 by adding *Corynebacterium sepedonicum* or bacterial ring rot of potatoes into the list of plant and animal parasites dangerous to crops. As provided in the Order of 11 July 1932 relating to plant protection, the importation, distribution, and transit are prohibited of:

1. all living plants and parts thereof infected by any of the parasites named in the list;
2. packing material which has been used for the transportation of such plants and parts thereof;
3. all other objects or products capable of introducing or spreading these parasites.

NEWS AND NOTES

Republic of Korea Adheres to the International Plant Protection Convention

The Government of the Republic of Korea has adhered to the International Plant Protection Convention, 1951, by depositing an instrument of adherence with the Director-General of FAO on 8 December 1953. This brings the number of countries contracting to the Convention, including both signatory and adhering members, to twenty, namely: Australia, Austria, Belgium, Cambodia, Canada, Ceylon, Chile, Denmark, Dominican Republic, Egypt, El Salvador, India, Indonesia, Japan, Republic of Korea, New Zealand, Republic of the Philippines, Spain, Sweden and the United Kingdom.

European Forestry Commission

The European Forestry Commission held its sixth session in Rome, 8–16 October 1953, attended by representatives from Austria, Belgium, Canada, Denmark, Finland, France, Western Germany, Ireland, Italy, the Netherlands, Norway, Portugal, Spain, Switzerland, the United Kingdom, the United States, and Yugoslavia. Several international organizations sent observers. The session considered many problems relative to forestry policy and technology, including the distribution and control of forest diseases and pests.

In accordance with the recommendation of the Third Session of the Commission, information on the outbreak of pests and diseases, gathered from its Member Governments in 1952 and 1953, was presented in a summarized form to this Session for examination. Included in this document are some items of special interest.

Western Germany reported that the cockchafer appeared again in 1953 in various regions of western Germany with devastating effect and the black timber bark beetle (*Xylosandrus germanus*), a pest hitherto unknown in Europe, was observed in stump wood, infesting an area of about 300 hectares near Darmstadt, in southern Germany. Great Britain noted a disease termed " group dying " of unknown cause which was responsible for the killing of pole-sized trees in groups of Sitka spruce and occasionally Norway spruce. Yugoslavia reported the occurrence of fall webworm (*Hyphantria cunea*) in 1948, of chestnut blight (*Endothia parasitica*) in 1950, and of the Tussock moth (*Lymantria dispar*) on oak in 1952. Chestnut blight remains a serious menace and continues to spread in Italy and Switzerland. Ink disease of chestnut (*Phytophthora cambivora*) has been recorded in Italy in areas totaling about 12,000 hectares and suspected to occur in other areas of about 8,000 hectares.

In order to facilitate the exchange of information on the occurrence and spread of forest pests and diseases, the Commission recommended that the Secretariat should investigate the possibility of obtaining from its member countries current information in this field to be published in the FAO *Plant Protection Bulletin*.

European Plant Protection Organisation

Mr. C. Staf, Netherlands Minister of Defence, accepted the unanimous invitation of the Council of the European Plant Protection Organisation (EPPO) to become Honorary President of that Organisation in May 1953. Mr. Staf was closely associated with the building-up in 1948 of the International Colorado Beetle Committee, which was the forerunner of EPPO. His interest in the progress of EPPO has never ceased.

The principal technical meeting held during the past year was the Working Party on the Control of Infestation in Stored Foodstuffs, which held a four-day meeting in Brussels in May-June 1953. The report, which contains a number of important recommendations and has some valuable technical appendices, has been widely circulated. Copies are still available, in English or French, and may be obtained on application to EPPO.

The control of muskrats in Europe is one of the objectives of EPPO, and considerable progress can be reported. An international conference, convened in Munich in June 1953, drew up a plan for reinforcing the efforts of Governments in areas specially dangerous from the standpoint of neighboring countries. This plan is now being put into operation, and an international fund to provide the necessary finance is being established. Further, a scheme of training in the strategy of muskrat control is being instituted in Germany, financed from the European Productivity Agency funds administered by the OEEC. Under this scheme, muskrat control supervisors from several European countries will be sent to Germany for short training courses in the spring and autumn of 1954 and 1955.

There is a growing tendency on the part of Governments to employ EPPO for making enquiries of European governments on matters of more than national interest. Recent examples are the enquiries on the control of sewer rats and on the incidence of wheat bulb fly in 1953, instituted at the request of the United Kingdom, on red spiders, at the request of Western Germany, and on chestnut blight, at the request of Belgium. EPPO is very glad to perform this sort of service.

Inter governmental meetings being convened by EPPO include a conference on the Mediterranean fruit fly in Algiers, 26-29 January 1954, and one on the fall webworm in Vienna, 22-23 February 1954. The latter conference will be followed by a meeting of the Executive Committee of EPPO.

The staff of EPPO has recently been strengthened by the appointment as Scientific Officer of Dr L. Caudri, who has been seconded for this purpose by the Dutch Government.

Roma - Tip. del Senato del dott. Giovanni Bardi

CEREAL BREEDING PROCEDURES

This FAO Development Paper covers the whole field from the hybridization of the parent plants until a new variety is in commercial production. Methods of growing hybrid populations, systems of testing and recording of results, variety purification and increase of pure seed, as well as the analysis of data, are treated in detail. Various types of nurseries are described for the breeding of varieties resistant to plant diseases and insect pests, and tolerant to certain climatic factors such as frost.

Special features of the publication are the sixteen appendices which graphically illustrate planting plans, plot arrangements, the statistical progress of a cross, variety purification and other features of a cereal breeding program. The complexity involved in modern plant breeding methods and the consequent necessity of systematizing the procedures are clearly and impressively indicated, 122 pages, $ 1.25; 6s. 6d.

LEGUMES IN AGRICULTURE

This unique collection of information on legumes, edited by R. O. Whyte, G. Nilsson-Leissner and H. C. Trumble, required the collaboration of specialists in every member country of FAO. No fewer than 111 contributors are acknowledged, and contributions from many more are mentioned in the text.

Nowhere else is such information available in one volume and, by pointing to the limitations in the data on economic botany, ecology and the biotic relationships of legumes it is hoped to encourage further research and experiment particularly in tropical and sub-tropical areas. An appendix tabulates the species, indicating plant characteristics, climatic adaptation, soil adaptation, utilization, number of seeds per pound and seeding rates in pounds per acre. 368 pp., many illustrations, $ 3.00; 15s.

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